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Distribution and local range of the Orinoco dolphin (*Inia geoffrensis*) in the Rio Apure, Venezuela

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Orinoco dolphins (*Inia geoffrensis*), in Venezuela known as Toninas, occur in the Orinoco, Rio Negro and tributaries in Venezuela. We intended to investigate: 1. Whether *Inia* is solitary and grouping is a result of aggregation in favourable habitats; 2. Whether there is evidence for migration, possibly in connection with seasonal movements of fish (Lowe-McConnell 1964); 3. Whether *Inia* is territorial.

We carried out a 17 day survey by boat during the end of the rainy season in 1989. Between July 27th and 30th, we covered 45 km of the Apure river to the west of San Fernando de Apure, using a 4.5 m long engine powered aluminium canoe. Between August 5th and 15th we covered 156 km of the Apure to the east of the town, 27 km of the Orinoco upstream from the mouth of the Apure and 27 km of the Apurito upstream from its mouth into the Orinoco using a 10 m long engine powered wooden dugout-canoe. Hours of observations were between 8:30 and 17:30 every day. Irregular rainfall interrupted the work so observation times could not be further standardized. Cloud cover and height of ripples on the water surface were noted on a scale from 0 (slight) to 3 (severe). The distance covered was followed on a map and sightings noted every 3 km interval. Numbers of sightings per interval were compared to a Poisson distribution of equal mean, using the chi square test (for methods refer to Magnusson et al. 1978).

For each sighting, depth of the river and stream velocity were noted: The depth was found by lowering a 5 kg iron weight attached to a rope with knots at 50 cm intervals to the bottom of the river. Stream velocity was measured holding the boat steady against the current with reference to a landmark on shore. A nail attached to a rope was lowered into the water up to a marked point. The rope was attached above a scale over which it swept as the current displaced the nail, giving a relative estimate of stream velocity. Measurements of depth and current speed were compared to the size of sighted groups, using Spearman's rank correlation coefficient (r_s).

The study was complemented by observations by boat and from shore of dolphins within a 3.5 km long stretch of the Apure. These observations were carried out from 22nd–26th August between 6:00 and 18:00 hours. The position of the animals was plotted on a large scale map. Natural markings of individual dolphins helped in this tracking effort.

The average density of *Inia* surveyed between August 5th and 15th was 0.56 animals per km with an average sighting frequency of 3.91 animals per hour. Highest densities were encountered in the Apurito (1.15 animals per km, 8.6 sightings per hour). Current and turbulence lead to inconsistency in boat speed, affecting the values for sightings per unit effort.

Individual *Inia* were found to be patchily distributed. The distribution of groups did not differ significantly from the Poisson distribution (Table). 58 % of our sightings were groups of two or more (Figure).

There was a significant (Spearman's rank coefficient $r_s = -0.608$; $P < 0.01$) relationship between group size and stream velocity. Most large groups were encountered in slow

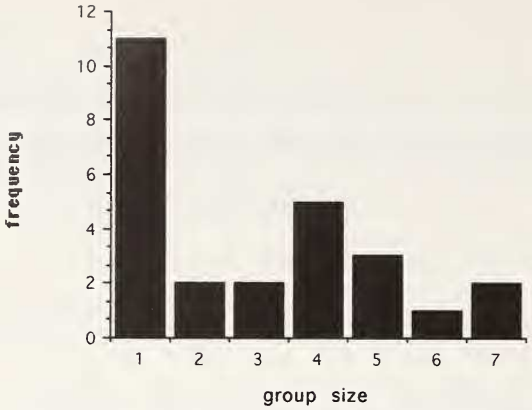

Fig. 1. Frequency distribution of *Inia geoffrensis*

running sections of the river, vicinity of flooded banks or clearwater tributaries. Most of the sightings occurred in 10 to 12 m deep water within 50 m from the bank.

During the observations following the boat survey, most groups of *Inia* were encountered regularly within defined ranges of approximately 130–800 m along the river. Dolphins following the boat repeatedly remained behind at fixed points but ranges overlapped and interactions between neighbouring groups occurred. No aggressive interactions were observed.

58 % of our sightings represent groups of two or more individuals compared with 20 % in the study of Magnusson et al. (1980). In accordance with points 1. and 2. of the introductory remarks, possible reasons could be:

1. Seasonal migration: *Inia* has been reported by Trebbau and van Bree (1974) to enter floodplains and smaller tributaries during the rainy season, though Best and Da Silva (1986) do not recognize any seasonal trend in the data, possibly due to lower annual

Distribution of individuals and groups per 3 km interval for each section of the survey as indicated above the columns

Statistical results	Apure (201 km)	West of San Fernando (45 km)	East of San Fernando (156 km)	Orinoco	Apurito
Individuals					
n	67	15	52	9	9
$\bar{x}$	0.43	0.27	0.48	1.11	3.44
Σx	29	4	25	10	31
Σx^2	119	6	113	34	213
Variance	1.61	0.35	1.98	4.86	13.20
$\chi^2 = \Sigma(x-\bar{x})^2/\bar{x}$	247***	18.25 NS	210***	20.61**	31.45***
Groups					
$\bar{x}$	0.194	0.200	0.308	0.556	0.667
Σx	13	3	16	6	6
Σx^2	19	3	16	8	8
Variance	0.250	0.171	0.217	0.280	0.500
$\chi^2 = \Sigma(x-\bar{x})^2/\bar{x}$	84.936*	12.000 NS	36.000 NS	14.789 NS	6.000 NS

The number of intervals in a section is noted as n and average sightings per interval as $\bar{x}$. Significant values for chi squared are marked * for $P < 0.05$, ** for $P < 0.01$ and *** for $P < 0.001$. For these, if the mean is maller than the variance, the distribution is patchy.

fluctuations in rainfall further south. The tendency of *Inia* to aggregate may be related to movements of characids and catfish into the floodplains to spawn and feed (Lowe-McConnell 1964, 1975). In the floodplains and the Apurito high densities of young catfish could be observed skimming the surface. In the fast flowing Apure, young catfish were occasionally observed in direct vicinity to the bank (maximum 3 m away).

2. Opportunistic aggregation: Several authors (Best and Da Silva 1986; Gewalt 1978; Trebbau and van Bree 1974; Trebbau 1975) have reported that the animals aggregate around anchored boats, areas of turbulence and in the mouths of tributaries. Da Silva (pers. com.) suggests that aggregations are not permanent as the animals may segregate after short periods. During our observations single animals and groups were frequently joined by others and would then separate. Our observations therefore lead to the same conclusion.

Earlier studies suggest that *Inia* may be a sedentary species occupying localized ranges at least during part of the year (see Best and Da Silva 1986, for a review). Similar observations lead Trebbau and van Bree (1974) to suggest that *Inia* may be territorial. Our observations of resident groups and individuals indicated that *Inia* occupies a limited range for at least part of the year. However, we found no evidence for aggressive or avoidance behaviour. We would therefore support Best and Da Silva's (1986) conclusion that *Inia* occupies an undefended homerange.

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References

Best, R. C.; Da Silva, V. M. F. (1989): Biology, status and conservation of *Inia geoffrensis* in the Amazon and Orinoco river basins. Occ. Pap. IUCN SSC **3**, 23–34.

Gewalt, W. (1978): Unsere Tonina (*Inia geoffrensis* Blainville, 1817) – Expedition 1975. Zool. Garten N. V. Jena **48**, 324–384.

Lowe McConnell, R. H. (1964): The fishes of the Rupununi savanna district of British Guyana, South America. Part 1. Ecological groupings of fish species and effects of the seasonal cycle on the fish. J. Linn. Soc. (Zool.) **45**, 103–144.

Magnusson, W. E.; Best, R. C.; Da Silva, V. M. F. (1980): Numbers and behaviour of Amazonian dolphins *Inia geoffrensis* and *Sotalia fluviatilis fluviatilis* in the Rio Solimões, Brazil. Aquatic Mammals **8**, 27–32.

Trebbau, P. (1975): Measurements and some observations on the freshwater dolphin, *Inia geoffrensis*, in the Apure River, Venezuela. Zool. Garten N. F. Jena **45**, 153–167.

Trebbau, P.; van Bree, P. H. (1974): Notes concerning the freshwater dolphin (*Inia geoffrensis* de Blainville, 1817) in Venezuela. Z. Säugetierkunde **39**, 50–57.

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